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Apparatus for processing trench bedding and pipeline surround material

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(71) Applicant(s)
Mitchell Australasia Pty Ltd

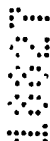
(72) Inventor(s)
Wayne Mitchell

(74) Agent/Attorney
WATERMARK PATENT and TRADEMARK ATTORNEYS, Locked Bag 5, HAWTHORN
VIC 3122

(56) Related Art
US 4633602
GB 2219330
US 4664791

ABSTRACT

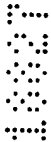
Apparatus for processing previously excavated trench material to form fine particulate material therefrom and for returning said fine particulate material back into the trench to act as padding material for a pipeline or the like, said apparatus including separation means for separating fine particulate material from the excavated trench material, said apparatus further including a structure positionable in the trench and configured to enable movement along the trench, said structure having a lower region adapted to receive fine particulate material from said separation means and a lower open face leading from said lower region through which said fine particulate material is discharged into a bottom region of said trench, said structure further having a levelling means located rearwardly of the discharge of fine particulate material from said lower region of the structure to level said fine particulate material and enable adjustment of the depth of said fine particulate material in said trench.



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COMPLETE SPECIFICATION STANDARD PATENT



Application Number:

Lodged:



Invention Title:

APPARATUS FOR PROCESSING TRENCH BEDDING AND PIPELINE
SURROUND MATERIAL



The following statement is a full description of this invention, including the best method of performing it known to :- us

APPARATUS FOR PROCESSING TRENCH BEDDING AND PIPELINE

SURROUND MATERIAL

The present invention relates to improved apparatus for creating and depositing bedding material in trenches, typically trenches for pipelines or the like.

- 5 It is conventional for a bedding material such as sand to be introduced into a trench to provide a smooth even bed on which a pipe line might be laid. Such bedding material might also conventionally be applied onto, around and immediately above such a pipeline whereby the pipeline is fully surrounded by the bedding material. In this way, no disconformities in the earth filling below, on
- 10 either side or above the pipeline is achieved providing a sound support for the pipeline in the trench. The provision of a separate bedding and pipeline surround material such as sand or the like adds significantly to the costs associated with installing such a pipeline and these costs can be quite considerable when the pipeline extends over a relatively long distance.
- 15 Australian Patent Specification No. 592815 discloses apparatus capable of utilising at least part of the excavated trench material as a bedding and pipeline surround material for a pipeline. The apparatus disclosed in this patent specification is moved along and adjacent to the previously formed trench over the excavated trench material from the trench picking up at least a part of this
- 20 material as the apparatus moves. This excavated trench material is conveyed rearwardly to a vibrating screen table which allows a proportion of fine particle material to pass through the screen onto a laterally directed conveyor located beneath the vibrating screen table. The laterally directed conveyor then conveys this fine particulate material back into the trench to act as a bedding and/or
- 25 pipeline surround material for a pipeline or the like. This apparatus works well and has the significant advantage of avoiding the costs of having to separately bring in another bedding or pipeline surround material such as sand. The apparatus, however, requires control of the amount of excavated trench material picked up to control the amount of fine particulate material returned to the trench
- 30 which inevitably is an inexact control of the fine material returned. This requires a certain degree of levelling operation of the bedding material to be carried out in the trench before a pipeline can be laid thereon.

The objective of the present invention is to provide apparatus capable of returning fine particulate material from the excavated trench material back into the trench but which will automatically level the bedding material returned and preferably by a further pass, place pipe surround material so as to minimise
 5 disruption to the previously bedded pipeline.

Accordingly, the present invention provides apparatus for processing previously excavated trench material to form fine particulate material therefrom and for returning said fine particulate material back into the trench to act as a bedding and/or pipeline surround material for a pipeline or the like, said apparatus
 10 including separation means for separating fine particulate material from the excavated trench material, said apparatus further including a structure positionable in the trench and configured to enable movement along the trench, said structure having a lower region adapted to receive fine particulate material from said separation means and a lower open face leading from said lower region
 15 through which said fine particulate material is discharged into a bottom region of said trench, said structure further having an adjustable levelling means located rearwardly of the discharge of fine particulate material from said lower region of the structure to level said fine particulate material and enable adjustment of the depth of said fine particulate material in said trench.

20 Preferred features and aspects of this invention may be in accordance with anyone of claims 2 to 17 as annexed hereto which are hereby made part of this disclosure.

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25 In accordance with a second aspect, the present invention includes apparatus for processing previously excavated trench material to form fine particulate material therefrom and for returning said fine particulate material back into the trench to act as padding material for a pipeline or the like, said apparatus including separation means for separating fine particulate material from the excavated trench material, said apparatus further including a structure positionable at least partially above the trench and configured to enable movement along the
 30 trench, said structure having a lower region adapted to receive fine particulate material from said separation means and a lower open face leading from said lower region through which said fine particulate material is discharged into a bottom region of said trench, said separation means including a vibrating screen separator

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located generally above said structure, the fine particulate material passing through said vibrating screen separation being dropped by gravity into said lower region of the structure, said vibrating screen separator being inclined to deposit material not passed through the vibrating screen separator towards a side of said trench.

Preferred features and aspects of this invention may be in accordance with any one of claims 19 to 26 as annexed hereto, which claims are hereby made part of the disclosure of this invention.

Apparatus according to this invention enables the separation of previously excavated trench material into fine particulate material and relatively coarser material with the fine particulate material being deposited directly back into the trench. The apparatus allows this material to be levelled as the apparatus moves along the trench thereby avoiding the need for this to occur as a separate handling step and by the use of a baffle plate, also use the apparatus for applying pipe surround material, as a further operation. Where the apparatus is used to apply padding material over and around a pipe already laid on bedding material, the levelling means capability is no longer required.

Further features and aspects of this invention will become apparent from the following description of one preferred embodiment given in relation to the accompanying drawings, in which:-



Fig 1 is a schematic end view of apparatus according to the present invention shown in a position of use within a previously excavated trench;

Fig 2 is a schematic side elevation view of the apparatus of Fig 1;

Fig 3 is a schematic end elevation of the apparatus of Fig 1 viewed from an opposite end; and

Fig 4 is a top plan view of the apparatus shown in Figs 1 to 3; and

Figure 5 is a view similar to Fig 3 showing a further preferred embodiment.

Referring to the drawings, the preferred apparatus 10 of the present invention is shown with at least its lower portions in a previously excavated trench

- 10 9. The apparatus 10 includes an upper vibrating screen separator table 11, an intermediary chute section 12 which includes connecting faces 13 that are clear of the level of the top of the trench, and a lower structure 14 located within the trench 9. The upper vibrating screen 15 of the separator table 11 is mounted on and directly above the intermediary chute section 13 via spring elements 16. A
- 15 drive shaft 17 runs beneath the full length of the screen 15 and joins discs 18 which include provision at 19 for out of balance weights providing the drive for vibrating the screen 15. The drive shaft 17 may be driven by any suitable means which conveniently includes a hydraulic motor 21 which derives its power from the pulling apparatus (not shown), and drive belt coupling 22. Drive to the motor 21
- 20 might conveniently be reversible such that the discs 18 may be selected to rotate in opposite directions. By such an arrangement, material deposited on the vibrating screen 15 will either tend to move down the screen or up the screen thereby remaining on the screen 15 for a longer period. The vibrating moment and throughput of the screen might need to be adjusted to suit differing types of
- 25 ground materials. This may be achieved by adjusting the hydraulic motor speed and/or the size of the out of balance weights connected at 19 to the discs 18. As shown in Figs 1 and 3, the vibrating screen 15 is inclined such that any material unable to pass downwardly through the screen 15 will eventually drop off the lower side of the screen 15 to be returned to the ground adjacent the trench 9.
- 30 Conveniently, material to be placed on to the vibrating screen 15 for separation may be the previously excavated material from the trench 9. This material may be placed on the screen either manually or by any other suitable separate mechanical means such as a front end loader or the like. If need be, the material

can be augmented from any ground or earth type material as it is not essential that it originates from the excavated trench material. In addition, where imported bedding material is used which already has a uniformly fine particle size, the vibrating screen may be removed, and the intermediary chute 12 and the lower structure 14 used in otherwise the same manner as described.

The intermediary chute arrangement 12 is simply adapted to receive all the fine particulate material passing through the screen 15 and to channel this fine material inwardly and downwardly via inwardly sloping walls into the lower structure 14 located within the trench 9. The lower structure 14 includes 10 opposing lateral side walls 23, 24 the lower edges 25, 26 of which support the apparatus on the bottom surface of the trench 9. A forward end 27 of the lower edges 25, 26 is curved upwardly as shown in Fig 2 to assist in a skid movement motion of the apparatus along the trench. In a possible alternative arrangement as shown in Fig 5, outrigger skid plates 50, 51 may be provided adapted to sit on 15 the earth surface 52 surrounding the trench 9. The skid plates 50, 51 may have an upright wall 53, 54 bolted at 55 to the side walls of the lower structure 14. A plurality of bolting holes may be provided vertically spaced to allow the position of the skid plates 50, 51 to be vertically adjusted. In this embodiment, the lower structure 14 is kept clear of the bottom of the trench 9. If desired the front edge of 20 the skid plates 50, 51 may be upturned to assist with riding over potential obstructions or alternatively might be plough formed to push loose earth, stones or rocks to one side away from the trench 9. Preferably angled brace members 56 or other bracing members such as gusset plates may be provided at spaced positions along the skid members 50, 51 to provide added strength. The 25 arrangement shown in Fig 5 might preferably be used once a pipe has been laid on bedding material in the trench 9. Moving the apparatus along the trench supported on this bedding material may have a tendency to move the pipe. Supporting the apparatus at ground level avoids this risk. Apparatus, not shown, is provided to effectively pull the apparatus 10 according to either embodiment 30 along the trench 9 during use of same in the direction of arrow 28. The walls 23, 24 are mounted to the chute section 12 in a manner permitting the spacing between same to be adjusted for differing width trench sizes. Similarly, the height of the walls 23, 24 may be adjusted for differing depths of trenches as may be

met from time to time. As shown in the drawings, a first baffle means 29 may be provided so as to direct fine particulate material towards the outer edges of the trench 9 when, for example, a pipeline has been laid and material is required on either side thereof. A second baffle means 30 may be provided to direct fine particulate material forwardly of the rear face or wall of the apparatus. The first baffle means 29 may conveniently be removably attached to the structure such that it can be removed when full width depositing of fine particulate material is desired, for example, prior to laying of the pipeline.

As best shown in Fig 1, the rear wall of the apparatus 10 within the lower section 14 is at least partially closed by an adjustable levelling mechanism 31. The mechanism 31 may include a vertically movable gate member 32 that is positionable such that its lower edge 33 extends substantially across the width of the trench 9 and acts to level and smooth the fine particulate material deposited into the lower structure 14 as it passes therefrom through the open lower face 34 of the structure 14. The gate member 32 is conveniently adjustable in width as the side walls 23, 24 are moved apart or towards one another for varying trench widths. The height of the gate member 32 may be adjusted by a suitable mechanism 35 which may also be used to quickly change the height should the rear wall be required to clear obstructions within the trench. The mechanism 35 comprises a lever 36 pivoted at 37 to a fixed support structure 38. The lever 36 may be adjustable in length to adjust the relative height of the gate member 32. The lever 36 may also be pivoted at 39 to the gate member 32 and also at 40 located adjacent to the lower pivot 39. Such an arrangement allows an activating force to be applied to the top of the lever 36 to quickly raise the gate member 32 as may be desired from time to time. In an alternative arrangement, if quick raising of the gate member is not required, the gate member may be simply adjustable upwardly or downwardly as may be desired. Moreover, an integral or separately adjustable groove forming member may be provided depending downwardly from a mid zone region of the gate member 32 being adapted to form a groove in which a pipe section might be laid. The front face 36 of the lower structure 14 is generally left open, at least at its lower regions, to avoid any difficulties of obstructions within the trench.

In one preferred embodiment, it is possible to have a lower section detachably mounted to an upper section, for example, between the intermediary chute section 12 and the lower structure 14. In this manner, alternative formats for the lower structure 14 might be utilised. For example, one version might include simply an adjustable rear gate member for levelling bedding material introduced into the trench without any baffles such as baffle member 29 and without a mechanism for quickly lifting the rear gate member. A second version of the structure 14 might include fixed baffles such as baffle member 29 and a quick lift mechanism for the rear gate member. The present invention also anticipates providing an arrangement wherein the upper sections (screening device 11 and chute 12) and the lower structure 14 may be fixed together with removable baffle members 29 and adjustable levelling gate members with quick lift release devices as described in the preceding paragraphs.

It will of course be appreciated that many modifications can be made to the form of the apparatus described above subject to falling within the scope of the annexed claims. For example, protective covers may be fitted over the hydraulic motor, pulleys, and belts, and a skirt may be provided to cover the open sides of the drive shaft, to both protect persons from contact with moving parts, and in the latter case, to also prevent the ejection of pieces of material which may cause impact injury.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Apparatus for processing previously excavated trench material to form fine particulate material therefrom and for returning said fine particulate material back into the trench to act as padding material for a pipeline or the like, said apparatus
- 5 including separation means for separating fine particulate material from the excavated trench material, said apparatus further including a structure positionable in the trench and configured to enable movement along the trench, said structure having a lower region adapted to receive fine particulate material from said separation means and a lower open face leading from said lower region
- 10 through which said fine particulate material is discharged into a bottom region of said trench, said structure further having a levelling means located rearwardly of the discharge of fine particulate material from said lower region of the structure to level said fine particulate material and enable adjustment of the depth of said fine particulate material in said trench.
- 15 2. Apparatus according to Claim 1, wherein said levelling means is adjustable in height.
3. Apparatus according to Claim 1 or Claim 2, wherein said separation means includes a vibrating screen separator.
4. Apparatus according to Claim 3, wherein said vibrating screen separator is
- 20 located generally above said structure located within the trench, the fine particulate material passing through said vibrating screen separation being dropped by gravity into said lower region of the structure located within the trench.
5. Apparatus according to Claim 4, wherein the fine particulate material is
- 25 arranged to pass over baffle plate means adapted to direct said particulate material more towards lateral sides of the trench rather than uniformly across the width of the trench.

6. Apparatus according to Claim 5, wherein the baffle plate means is removably attached to said apparatus.
7. Apparatus according to anyone of Claims 3 to 6, wherein the vibrating screen separator is inclined to deposit material not passed through the screen separator onto the ground adjacent said trench.
8. Apparatus according to anyone of Claims 1 to 7, wherein said structure is supported on lower edge regions of opposing lateral walls, said lower edge regions being formed as skid means to enable movement of the structure along a said trench.
9. Apparatus according to any one of Claims 1 to 7, wherein said structure includes support means laterally extending therefrom on either side to support said apparatus on upper side edge zones of said trench.
10. Apparatus according to Claim 9, wherein said support means includes ground engaging skid members.
11. Apparatus according to Claim 9 or Claim 10, wherein said support means is vertically adjustable.
12. Apparatus according to anyone of Claims 1 to 11, wherein said structure includes opposing lateral walls, the distance between said opposing lateral walls being adjustable for varying trench widths.
13. Apparatus according to anyone of Claims 1 to 12, wherein said structure includes opposing lateral walls, the height of said walls being adjustable for varying trench depths.
14. Apparatus according to anyone of Claims 1 to 13, wherein said adjustable levelling means is capable of quick release from a set adjusted levelling position to enable overriding of any fixed obstruction within the trench.

15. Apparatus according to anyone of Claims 1 to 14, wherein said adjustable levelling means comprises a vertically movable gate member forming at least part of a rear wall of said structure.

16. Apparatus according to Claim 15, wherein said gate member spans
5 substantially a full width of the rear wall of said structure.

17. Apparatus according to Claim 15 or Claim 16, wherein the gate member is adjustable in width.

18. Apparatus for processing previously excavated trench material to form fine particulate material therefrom and for returning said fine particulate material back
10 into the trench to act as padding material for a pipeline or the like, said apparatus including separation means for separating fine particulate material from the excavated trench material, said apparatus further including a structure positionable at least partially above the trench and configured to enable movement along the trench, said structure having a lower region adapted to
15 receive fine particulate material from said separation means and a lower open face leading from said lower region through which said fine particulate material is discharged into a bottom region of said trench, said separation means including a vibrating screen separator located generally above said structure, the fine particulate material passing through said vibrating screen separation being
20 dropped by gravity into said lower region of the structure, said vibrating screen separator being inclined to deposit material not passed through the vibrating screen separator towards a side of said trench.

19. Apparatus according to Claim 18, wherein the fine particulate material is arranged to pass over baffle plate means adapted to direct said particulate
25 material more towards lateral sides of the trench rather than uniformly across the width of the trench.

20. Apparatus according to Claim 19, wherein the baffle plate means is removably attached to said apparatus.

21. Apparatus according to anyone of Claims 18 to 20, wherein said structure is supported on lower edge regions of opposing lateral walls, said lower edge regions being formed as skid means to enable movement of the structure along a said trench.

5 22. Apparatus according to any one of Claims 18 to 20, wherein said structure includes support means laterally extending therefrom on either side to support said apparatus on upper side edge zones of said trench.

23. Apparatus according to Claim 22, wherein said support means includes ground engaging skid members.

10 24. Apparatus according to Claim 22 or Claim 23, wherein said support means is vertically adjustable.

25. Apparatus according to anyone of Claims 18 to 24, wherein said structure includes opposing lateral walls, the distance between said opposing lateral walls being adjustable for varying trench widths.

15 26. Apparatus according to anyone of Claims 18 to 25, wherein said structure includes opposing lateral walls, the height of said walls being adjustable for varying trench depths.

DATED this 15th day of August 2003

MITCHELL AUSTRALASIA PTY LTD

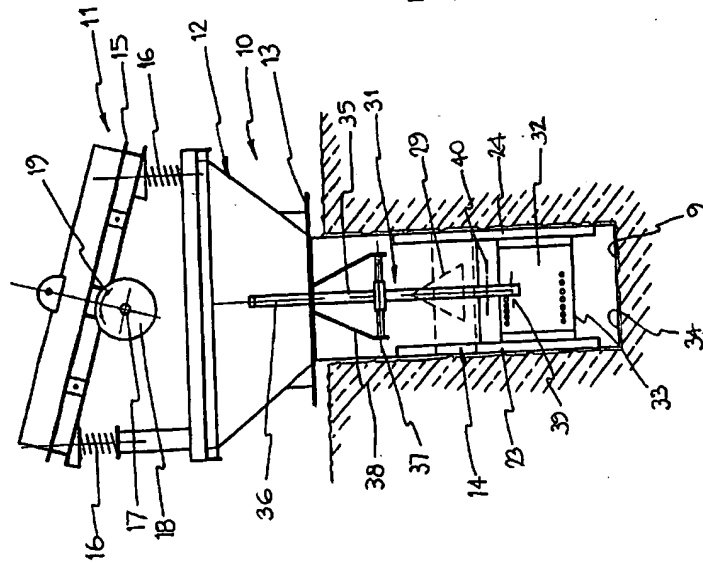
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FIG 1.



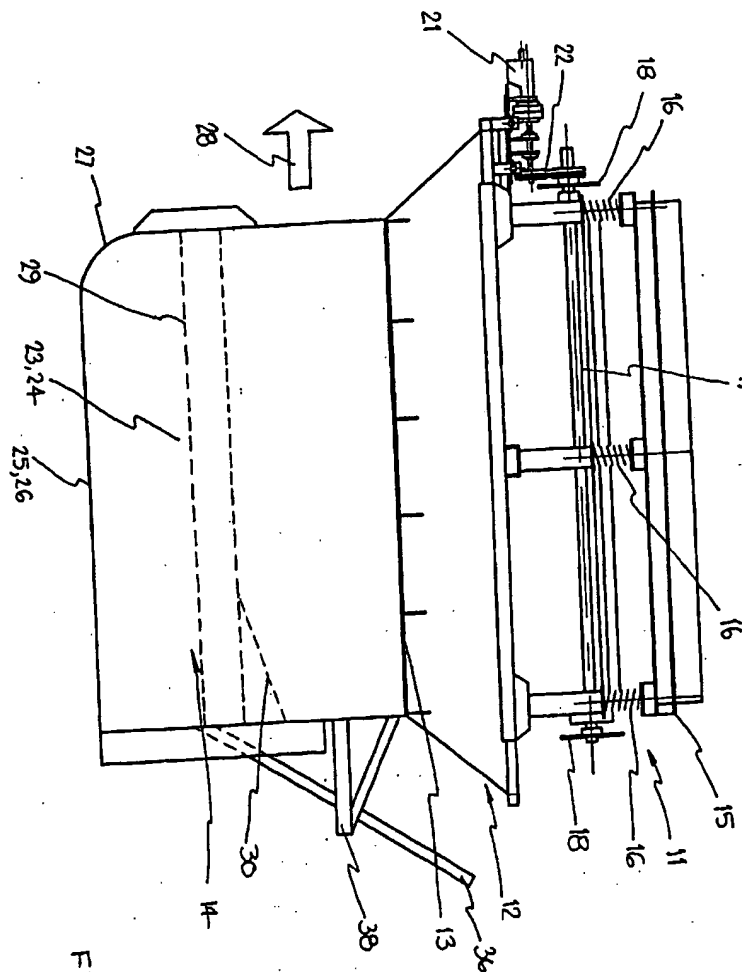
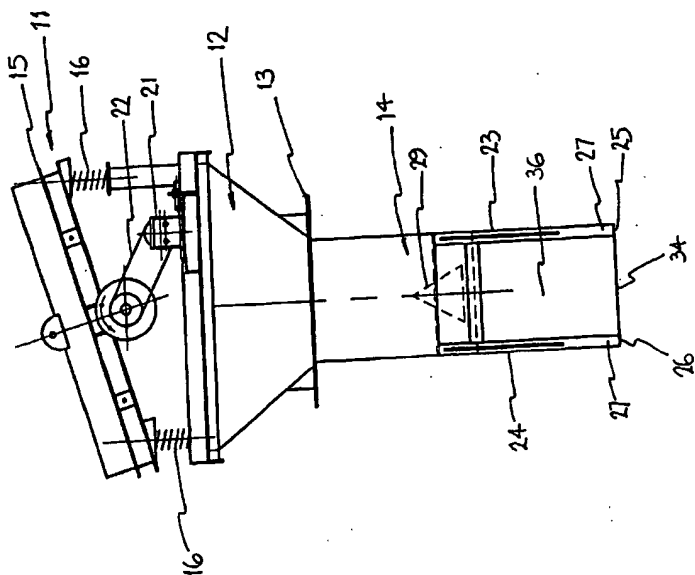


FIG 2.

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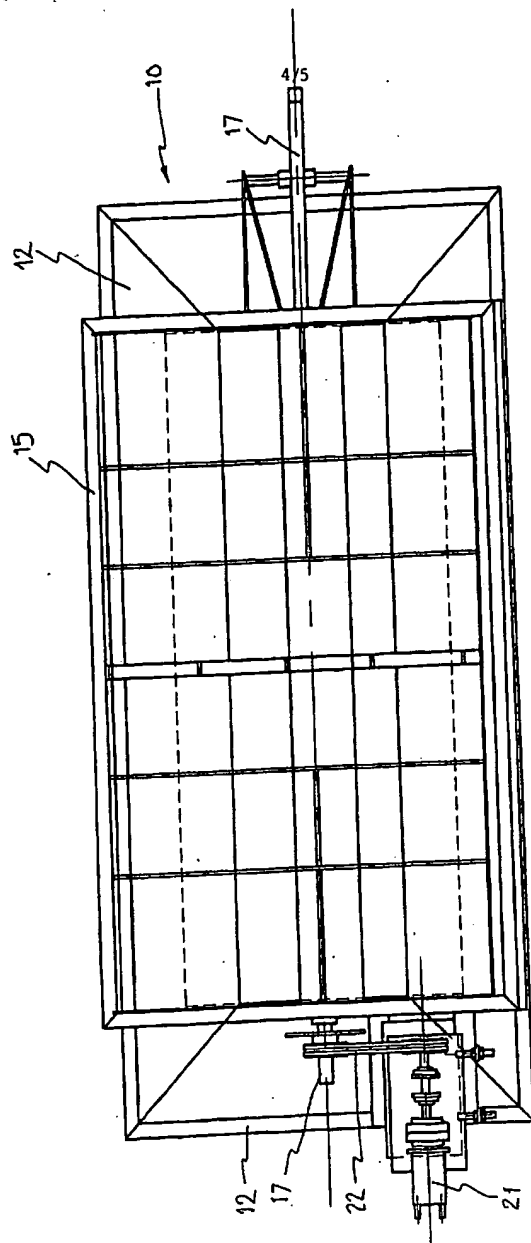
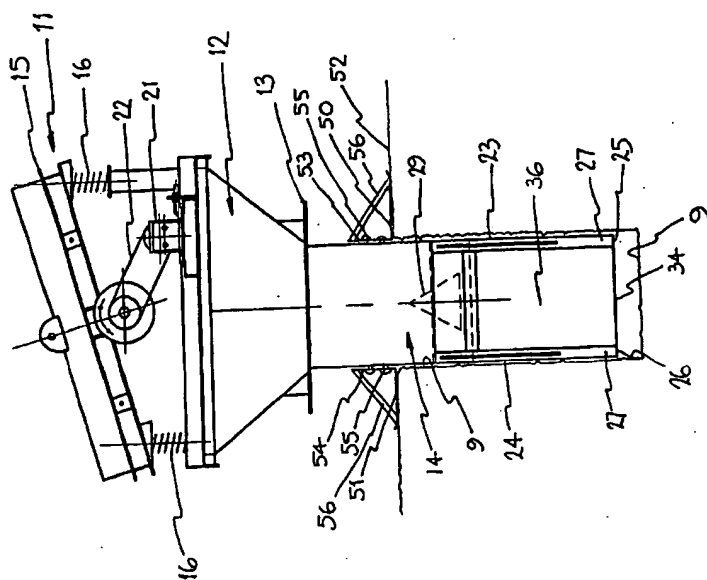


FIG 4.

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